UNDERSTANDING AND OVERCOMING FACTORS THAT INHIBIT ACCEPTANCE OF NCTM'S CURRICULUM AND EVALUATION STANDARDS FOR SCHOOL MATHEMATICS

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The 78,000 membership National Council of Teachers of Mathematics (NCTM) has written a set of professional specifications to improve the quality of school mathematics. This document will shape the national, state, and local curricula, textbooks, and standardized tests as no document ever has in mathematics education. *NCTM's Curriculum and Evaluation Standards for School Mathematics* (1989) will directly affect every educator who teaches mathematics in our public and private schools in the country. The challenge is to ensure these standards are accepted by society and properly incorporated into our schools' mathematics programs.

The *Standards* is a response to the crisis in the teaching and learning of mathematics. The current shortage of well-qualified instructors, the outdated curriculum, the inadequacy of textbooks that shape our curriculum, and the limited variety of ways we measure the outcomes of mathematics instruction are results of this crisis. It seems every week we hear of a new national study that portrays a pattern of inadequate student achievement. The results from international research point out U.S. students lagging far behind their counterparts in other countries at every grade level.

The 54 standards propose the basis for a balanced curriculum that focuses on both mathematical ideas and processes. They give a greater emphasis to conceptual development, mathematical reasoning, and problem solving. They also place less emphasis on paper-and-pencil computational proficiency. The *Standards* call for changes in instructional practices in which the roles of both students and teacher are redefined. In particular, considerable attention should be given to contextual learning where the role of the students is to analyze, apply, communicate, conjecture, construct, describe, develop, discuss, examine, explore, investigate, model, predict, prove, represent, solve, transfer, use, and validate. Similarly, the role of the teacher shifts to accept, care, challenge, clarify, consult, discuss, encourage, engage, evaluate, extend, facilitate, foster, guide, interact, listen,

monitor, observe, probe, question, re-direct, and reflect.

So what do we, as mathematics educators, do to get the *Standards* implemented? First, we must be realists. We must realize how schools actually operate, not how we say they operate. We must "understand the problems."

FACT ONE: Our mathematics curriculum in schools is not a spiralling curriculum, it is a circular one--of constant radius (Crosswhite, 1986). In schools, we go over the same topics, the same way. Look at the table of contents of a fifth-grade text, an eighth-grade text, and a high school general math text. You will not see much difference. The invert-and-multiply method that failed for fifth, sixth, and seventh graders is the same exact method the eighth graders are shown. Who is slow here?

FACT TWO: Kids learn by doing. Currently however, teachers teach mostly by telling. Actually, it is not the "doing" that results in learning, it is the metacognition, the thinking about the "doing" that results in learning. Remember Piaget? We know we must teach from the concrete towards the abstract. We need to be using manipulatives for the kindergartners and for the algebra students, then teaching for transfer to the higher levels of thinking.

FACT THREE: Teachers teach what is in the textbook. Students learn only what is on the test. An instructional aid (the textbook) and an evaluation instrument (a test) dictate the curriculum being taught in our schools. There is no "local control" of our schools. The classroom teacher has the least control of what should be taught.

FACT FOUR: We do not teach mathematics. We teach children. Children are not the end product of our job; they are our co-workers.

There are, thank goodness, exceptions to these facts. Exceptional students are labeled gifted, and sometimes they get special classes. Exceptional teachers are respected, although they do not get any special pay. Exceptional schools get publicity, since they are so rare.

So what else must we do to get the *Standards* to the students? We also must manipulate the forces that control teaching. Several areas must be addressed in a coordinated effort. Creating and publicizing of the *Standards* is an excellent first step. But the movement will die if we do not support the *Standards* by doing the following:

(1) State and local school curriculum must be revised to be consistent with the *Standards*.

(2) Coordinated long-range inservice must begin to explain, demonstrate, and model the *Standards*. It is unrealistic to suppose that presenting teachers with different textbooks and new activity materials will change teaching practices without support.

(3) Preservice methods classes must be based upon these guidelines. Teachers teach the way they are taught. The *Standards* require a change in the usual methods of teaching mathematics. Teachers, young and old, will need models that exemplify these new methods.

(4) State and local professional organizations must be vocally and financially supportive of the *Standards*. Implementing the *Standards* should be the goal of each meeting, inservice, publication, and news release of every organization.

(5) Textbooks which do not follow the *Standards* must not be allowed on a state's adoption list. California has shown the textbook companies can be responsive to financial pressure. Kentucky delayed their 1989 adoption of mathematics texts for one year to give publishers time to correlate with the *Standards*.

(6) Standardized tests also must follow the *Standards*. Computation and one-step problems must receive less emphasis; reasonability, estimation, problem solving, and mathematical relationships must receive more emphasis. As we know, the tail is wagging the dog. Norm-referenced tests are to evaluate what goes on in the classroom, but if this is true, why are there so very few national tests which allow students to use calculators? Again change can only be accomplished by financial pressure through state adoption.

(7) Teacher evaluation for teaching mathematics also must be based upon the criterion of the *Standards*. The same is true for school evaluation. Teachers will only work towards goals "deemed valuable" by their peers and supervisors. If we do not have acceptable evaluation of teaching instrument(s), based upon the *Standards*, that school corporations can use, districts will find another, less desirable standard.

The President of the National Council of Teachers of Mathematics, Shirley Frye, stated,

> "What causes us to falter are the inhibitors of change--limited commitment, lack of funding, unclear direction, contentment with the status quo, and negative outlooks. What enables us to change are

alternatives that are well formulated, clearly communicated, effectively executed, and broadly supported." (Frye, 1988)

The time is ripe for change in mathematics education. NCTM's *Standards* is proposing the first step for change. Now it is up to us to continue the process. We must be prepared.

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Mathsearch Contest

N	P	N	D
O	U	A	E
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G	A	B	E

Mathsearch Contest

Mathsearch Contest

The object is to arrange letters to form math words of four or more letters. No letter may be used more than once in a word. Plurals are acceptable. Only math words used in grades K–12 count. Score one point for each letter after the third.

Readers are invited to submit Mathsearch arrays with higher point totals than the sample. (Please include a list of the words.) The best will be published in the next issue of the Journal, space permitting.

Sample answer is on page 32.